Chemosaturation with percutaneous hepatic perfusion (PHP): Initial experience in Spain


INTRODUCTION AND OBJECTIVES

The liver has been the primary target of the methods of regional chemotherapy with the aim of limiting toxicity of systemic chemotherapy. These methods allow high drug concentrations in tumors compared to systemic administration (Table 1).

A hepatic arteriography was performed (Fig 1a) to verify that the previously embolized extrahepatic branches arising from hepatic arteries were occluded. Two days before allopurinol was given to prevent the toxicity of melphalan. On the day of treatment, under general anesthesia, blood pressure control, and full anticoagulation, the patient was sent to the intensive care unit (ICU) for monitoring.

Chemotherapy DTIC, and was scheduled for two sessions of chemosaturation-PHP with melphalan. Table 1 shows the doses of melphalan that were administered during the two procedures.

RESULTS

The hospital stay was 4–6 days. Deep blood pressure changes, during balloon inflation, needed high skills in anesthetics for major vascular procedures. After the procedure, patients remained in the ICU 24 hours. As described in literature, mild to moderate thrombocytopenia and anemia resulting from removal of platelets and red blood cells by the hemofiltration system, was observed immediately after the procedure. Two patients, one during the first session and the other during the second, showed a decrease in white blood cells and platelets. In all procedures Ca++ decrease was observed and corrected in two. In the first 12 hours patients had polyuria in all procedures. No transient increases in liver transaminases were observed during the post-procedure period.

CONCLUSION

Chemosaturation with PHP is a minimally invasive whole organ new promising regional hepatic therapy. Technically not difficult but requires a very good team organization. Is repeatable. Despite high doses of melphalan tolerance is excellent.

REFERENCES


3. Hepatic venous effluent blood was filtered via extracorporeal hemofiltration as shown (Fig 1c,d), to avoid as this may result in serious injury or death. Once the cava vein occlusion balloons were inflated, all extrahepatic branches (Fig 1b) remained occluded. The catheter was positioned so that the agent was infused only with extrahepatic destination and origin in hepatic arteries was occluded. Two days before allopurinol was given (Fig 1e), melphalan 3mg/kg, diluted in 500 ml saline, was given via pump in 30 min. After the infusion, hepatic artery anticoagulation was reversed with protamine. Catheters were removed and the patient was sent to the intensive care unit (ICU) for monitoring.


Table 1. Comparison of the melphalan dose to different treatments. PHP 10x drug dosing higher than FDA approved via systemic dose, and 100x drug dosing delivered to tumor that of systemic chemotherapy.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Melphalan (mg)</th>
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<tbody>
<tr>
<td>Systemic administration</td>
<td>0.25 mg/kg</td>
</tr>
<tr>
<td>Chemoembolization</td>
<td>0.62 mg/kg</td>
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<tr>
<td>Surgical Isolated Hepatic Perfusion (HIP)</td>
<td>1.5 mg/kg</td>
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<tr>
<td>Percutaneous Hepatic Perfusion (PHP)</td>
<td>3.0 mg/kg</td>
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<tr>
<td>Myeloblation</td>
<td>2.5-3.5 mg/kg</td>
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Table 2. Response to treatment. mm: sum of diameters whole liver mets.

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<th>Procedure</th>
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<th>Patient 2</th>
<th>Patient 3</th>
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<tr>
<td>1st PHP</td>
<td>Day 0</td>
<td>Day 0</td>
<td>Day 0</td>
</tr>
<tr>
<td>MR</td>
<td>184mm</td>
<td>377mm</td>
<td>143mm</td>
</tr>
<tr>
<td>MR Day 127</td>
<td>102mm</td>
<td>169mm</td>
<td>102mm</td>
</tr>
<tr>
<td>% decrease</td>
<td>44.6%</td>
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Fig 1. Hepatic arteriography to verify that the previously embolized extrahepatic branches arising from hepatic arteries remained occluded. b, gastrointestinal artery occluded with coils (white arrows) in the procedure done two weeks before; c, double-balloon catheter percutaneously into the inferior vena cava to isolate (d) the hepatic venous blood; e, hepatic perfusion (white arrows) with melphalan during isolation of hepatic output with balloons (asterisks).

Fig 2. Chemosaturation-PHP drawing system (Hepatic CHEMOSAT Delivery System; Delcath Systems Inc., New York, NY) with consists of a closed circuit of catheters and filters designed to deliver chemotherapy to the hepatic artery and then filter effluent hepatic venous blood before it is returned to the systemic circulation.

RESULTS

Operation room time was 4-5 hours. Deep blood pressure changes, during balloon inflation, needed high skills in anesthetics for major vascular procedures. After the procedure, patients remained in the ICU 24 hours. As described in literature, mild to moderate thrombocytopenia and anemia resulting from removal of platelets and red blood cells by the hemofiltration system, was observed immediately after the procedure. Two patients, one during the first session and the other during the second, showed a decrease in white blood cells and platelets. In all procedures Ca++ decrease was observed and corrected in two. In the first 12 hours patients had polyuria in all procedures. No transient increases in liver transaminases were observed during the post-procedure period.

The hospital stay was 4-5 days. Treatment response was measured with the changes in the sum of the diameters of all hepatic lesions. The first patient, who received two sessions of chemosaturation-PHP, presented at 6 weeks a 44.6% tumor shrinkage (Fig 3a,b), and 72.3% at 6 months (Fig 3c,d). At the time of writing, one year after the first session, is still in progression-free survival (PFS). The second patient presented at 5 weeks a 55% tumor shrinkage (Fig 4) and is following. Table 2.

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